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AGRICULTURAL MEMORANDUM NO 371

Measurements of the shelter effect in the lee of plastic windbreak materials

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1. Introduction. During recent years a number of new plastic materials have become available which are considered suitable for use as windbreaks to protect horticultural crops. Samples of four such materials are in use at Rosewarne EHS and during August-December 1970 these were loaned to Bristol so that tests could be made on their effectiveness as windbreaks.

2. Description of site. Field 3 at Cleppa Park EHS was available for use throughout the period. The field slopes from W to E at about 1:12 near the top where the experiments were carried out. There were rows of trees, varying from 40 to 60 feet high, with isolated trees to 70 ft near the north, east and south edges of the field. The site was chosen near the west edge so that none of the trees would be nearer than about 700 ft (ie 10-18 h distant). The wind directions during the tests were between SW and NW so that any effects of the trees were minimal.

A basic framework of posts was erected such that a material for testing could be erected quickly, as nearly normal as possible to the prevailing wind. The framework consisted of 4 ft high posts erected in 4 lines 100 ft long: i) N-S, ii) E-W, iii) NW-SE, iv) NE-SW.

3. Materials. The nettings were all 4 ft high and 100 ft runs were used. The permeabilities of the nets were measured at NVRS Wellesbourne using a two dimensional photographic method. It is possible that the permeability should be reduced slightly to allow for thickness.

Lenoweave	45% permeable
Downey (Sacks) knitted mesh	46% "
Rokolene	52% "
Grant polypropylene netting	65% "

(see Appendix for sources of nets)

4. Instruments. Fuess cup counter anemometers were set up at 2 ft ($\frac{1}{2}$ h) along a central line at right-angles to the screen and at the following distances from it:

8 h windward; 1 h, 2 h, 3 h, 4 h, 8 h, 16 h and 20 h leeward

Six sensitive cup anemometers were set up at 1 ft ($\frac{1}{4}$ h) and 3 ft ($\frac{3}{4}$ h) on alternate runs at:

8 h windward; 1 h, 2 h, 4 h, 8 h and 16 h leeward

In addition, a Fuess anemometer was used at 3 h during the tests on the Lenoweave & Rokolene nets. A number of runs of up to 60 minutes duration were made at each height for each net.

FGS stock34

5. Results. These are expressed as relative shelter, assuming that the 8 h windward anemometer measures the unobstructed wind.

Length of screens : 100 ft

Height of screens : 4 ft = h

The directions of incidence of the wind are given and 60-90° refers to angles within 30° of the line at right-angles to the screen.

Table I Relative shelter in the lee of various plastic screens

a) Height of anemometer cups 3 ft = $\frac{3}{4}$ h

	Lenoweave	Downey Mesh	Rokolene	Grant Polypropylene
Permeability (%)	45	46	52	65
No of runs	2	2	3	2
Incidence	60-90°	60-80°	60-80°	70-80°
Position				
1 h	54	55	36	34
2 h	52	50	38	30
3 h	51		33	
4 h	42	42	26	28
8 h	28	26	14	20
16 h	12	8	9	8

b) Height of anemometer cups 2 ft ($\frac{1}{2}$ h)

	Lenoweave	Downey Mesh	Rokolene	Grant Polypropylene
Permeability (%)	45	46	52	65
No of runs	5	4	4	4
Incidence	60-90°	60-80°	60-80°	70-80°
Position				
1 h	44	51	26	25
2 h	55	59	34	29
3 h	53	59	41	31
4 h	55	54	36	30
8 h	32	27	19	22
16 h	5	4	11	5
20 h	2	1	4	6

c) Height of anemometer cups 1 ft ($\frac{1}{4}$ h)

	Lenoweave	Downey Mesh	Rokolene	Grant Polypropylene
Permeability (%)	45	46	52	65
No of runs	3	2	2	2
Incidence	60-90°	60-80°	60-80°	70-80°
Position				
1 h	30	41	13	24
2 h	57	55	32	31
3 h	65		49	
4 h	57	58	35	42
8 h	31	28	15	24
16 h	5	-4	0	9

6. Discussion. The results show substantial degrees of shelter up to 8 h particularly for Lenoweave and Downey Mesh. However by 16 h to leeward very little shelter effect was apparent. Hogg (1) gives the results obtained using other materials and the following table is based on that work together with the results in this paper.

Table II Relative shelter in the lee of various 4 ft fences

Length of fences = 100 ft
Incidence of wind = 60-90°
Height of anemometer = 2 ft ($\frac{1}{2}$ h)

Type	Permeability %	Leeward distance 2h	4h	8h	16h	Total
Single wire mesh	85	6	1	6	5	18
Double wire mesh	75	15	11	10	10	46
Coir netting	50	53	53	42	15	163
Vertical lath	48	57	57	35	4	153
Horizontal lath	45	66	55	23	5	149
Polythene net	43	33	35	11	-1	78
Plastic strips	42	54	26	29	10	119
Iron sheeting	0	60	51	45	12	168
Lenoweave	45	55	55	32	5	147
Downey Mesh	46	59	54	27	4	144
Rokolene	52	34	36	19	11	100
Grant Polypropylene	65	29	30	22	5	86

Lenoweave and Downey Mesh provide relative shelter very similar to that shown by vertical or horizontal laths which have similar permeabilities.

7. Acknowledgments. Thanks are due to the Director of Rosewarne EHS for providing the materials and to the Director and staff of Cleppa Park EHS for making it possible to carry out the field work, and to Mr A J Pearson who gave much assistance in the field work.

8. Reference

W H Hogg 1964-65. Measurements of the shelter effect of land forms and other topographical features, and of artificial wind-breaks. Scient. Hort. Vol. XVII, 20-30.

Any comments or suggestions on this paper should be sent to the author.

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APPENDIX

SOURCES OF PLASTIC NETTINGS

The nettings used in these experiments were loaned by the Director of Rosewarne EHS who had obtained them from:

Lenoweave - Firmin & Co
Handford Works, Ipswich

Downey Mesh - J Downey (Sacks) Ltd
Pear Tree Works
Upper Langford, Bristol BS18 7DJ

Rokolene - Roko Containers Ltd
Sefton Works
Field Lane
Litherland, Liverpool L21 9LZ

Grant Polypropylene - W G Grant & Co Ltd
PO Box 43
Dundee